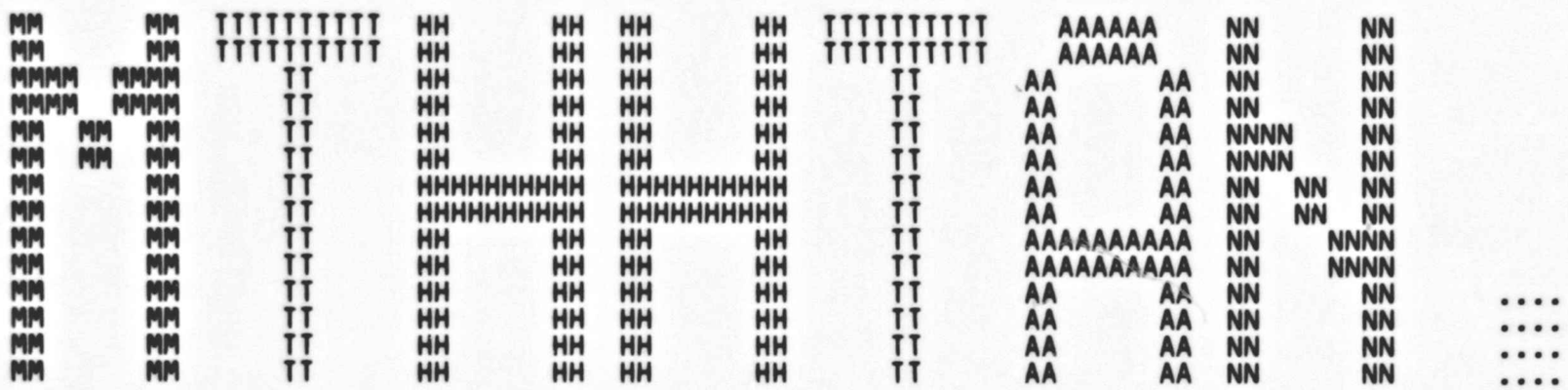
```
MMM          MMM  TTTTTTTTTTTTTTT  HHH          HHH  RRRRRRRRRRR     TTTTTTTTTTTTTTT  LLL
MMM          MMM  TTTTTTTTTTTTTTT  HHH          HHH  RRRRRRRRRRRR    TTTTTTTTTTTTTTT  LLL
MMM          MMM  TTTTTTTTTTTTTTT  HHH          HHH  RRRRRRRRRRRR    TTTTTTTTTTTTTTT  LLL
MMMMMM    MMMMMM        TTT       HHH          HHH  RRR         RRR       TTT         LLL
MMMMMM    MMMMMM        TTT       HHH          HHH  RRR         RRR       TTT         LLL
MMMMMM    MMMMMM        TTT       HHH          HHH  RRR         RRR       TTT         LLL
MMM  MMM  MMM           TTT       HHH          HHH  RRR         RRR       TTT         LLL
MMM  MMM  MMM           TTT       HHH          HHH  RRR         RRR       TTT         LLL
MMM  MMM  MMM           TTT       HHH          HHH  RRR         RRR       TTT         LLL
MMM       MMM           TTT       HHHHHHHHHHHHHHH  RRRRRRRRRRR         TTT         LLL
MMM       MMM           TTT       HHHHHHHHHHHHHHH  RRRRRRRRRRRR        TTT         LLL
MMM       MMM           TTT       HHHHHHHHHHHHHHH  RRRRRRRRRRRR        TTT         LLL
MMM       MMM           TTT       HHH          HHH  RRR   RRR           TTT         LLL
MMM       MMM           TTT       HHH          HHH  RRR   RRR           TTT         LLL
MMM       MMM           TTT       HHH          HHH  RRR   RRR           TTT         LLL
MMM       MMM           TTT       HHH          HHH  RRR      RRR        TTT         LLL
MMM       MMM           TTT       HHH          HHH  RRR      RRR        TTT         LLL
MMM       MMM           TTT       HHH          HHH  RRR      RRR        TTT         LLL
MMM       MMM           TTT       HHH          HHH  RRR         RRR     TTT         LLLLLLLLLLLLLLL
MMM       MMM           TTT       HHH          HHH  RRR         RRR     TTT         LLLLLLLLLLLLLLL
MMM       MMM           TTT       HHH          HHH  RRR         RRR     TTT         LLLLLLLLLLLLLLL
```


MM MM TTTTTTTTTT HH HH HH TTTTTTTTTT AAAAAA NN NN
MM MM TTTTTTTTTT HH HH HH TTTTTTTTTT AAAAAA NN NN
MMMM MMMM TT HH HH HH TT AA AA NN NN
MMMM MMMM TT HH HH HH TT AA AA NN NN
MM MM MM TT HH HH HH TT AA AA NNNN NN
MM MM MM TT HH HH HH TT AA AA NNNN NN
MM MM TT HHHHHHHHHH HHHHHHHHHH TT AA AA NN NN NN
MM MM TT HHHHHHHHHH HHHHHHHHHH TT AA AA NN NN NN
MM MM TT HH HH HH TT AAAAAAAAAA NN NNNN
MM MM TT HH HH HH TT AAAAAAAAAA NN NNNN
MM MM TT HH HH HH TT AA AA NN NN ....
MM MM TT HH HH HH TT AA AA NN NN ....
MM MM TT HH HH HH TT AA AA NN NN ....
MM MM TT HH HH HH TT AA AA NN NN ....
LL IIIIII SSSSSSSS
LL IIIIII SSSSSSSS
LL II SS
LL II SS
LL II SS
LL II SS
LL II SSSSSS
LL II SSSSSS
LL II SS
LL II SS
LL II SS
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LLLLLLLLLL IIIIII SSSSSSSS
LLLLLLLLLL IIIIII SSSSSSSS

Table of contents

(2) 54 HISTORY ; Detailed Current Edit History
(3) 66 DECLARATIONS ; Declarative Part of Module
(4) 110 MTH$HTAN - Standard H Floating HTAN
(5) 158 MTH$HTAN_R7 - JSB entry point
(6) 207 MTH$HTAN_R5 - JSB entry point
(7) 262 MTH$HTAND - Standard H Floating HTAND
(8) 309 MTH$HTAND_R7 - JSB entry point
(9) 369 MTH$HTAND_R5 - JSB entry point

```
0000     1          .TITLE  MTH$HTAN        ; H Floating Point Tangent routine
0000     2                                  ; (HTAN, HTAND)
0000     3          .IDENT /1-006/          ; File: MTHHTAN.MAR  EDIT:  RNH1006
0000     4 ;
0000     5 ;*****************************************************************************
0000     6 ;*                                                                           *
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0000    23 ;*  SOFTWARE ON EQUIPMENT WHICH IS NOT SUPPLIED BY DIGITAL.                  *
0000    24 ;*                                                                           *
0000    25 ;*                                                                           *
0000    26 ;*****************************************************************************
0000    27 ;
0000    28 ;
0000    29 ; FACILITY: MATH LIBRARY
0000    30 ;++
0000    31 ; ABSTRACT:
0000    32 ;
0000    33 ; MTH$HTAN is a function  which  returns the H floating point tangent
0000    34 ; of its H floating point radian argument. The call is standard
0000    35 ; call-by-reference.  It JSB to MTH$HTAN_R7.
0000    36 ;
0000    37 ; MTH$HTAND is a function  which  returns the H floating point tangent
0000    38 ; of its H floating point degree argument. The call is standard
0000    39 ; call-by-reference.  It JSB to MTH$HTAND_R7.
0000    40 ;
0000    41 ;--
0000    42 ;
0000    43 ; VERSION: 1
0000    44 ;
0000    45 ; HISTORY:
0000    46 ; AUTHOR:
0000    47 ;       John A. Wheeler, 15-Oct-1979: Version 1
0000    48 ;
0000    49 ; MODIFIED BY:
0000    50 ;
0000    51 ;
0000    52 ;
```

```
0000     54          .SBTTL  HISTORY ; Detailed Current Edit History
0000     55
0000     56
0000     57 ; Edit History for Version 1 of MTH$HTAN
0000     58 ;
0000     59 ; 1-001 - Adapted from MTH$GTAN version 1-001.  JAW 15-Oct-1979
0000     60 ; 1-002 - Call MTH$SIGNAL with user PC arg for JSB.  SBL 31-Oct-1979
0000     61 ; 1-003 - Added degree entry points. RNH 8-MAR-1981
0000     62 ; 1-004 - Added MTH$HTAN_R7, and MTH$HTAND_R7.  RNH 27-AUG-81.
0000     63 ; 1-005 - Change shared external references to G^ RNH 25-Sep-81
0000     64 ; 1-006 - Change remaining external references to G^.  RNH 06-Oct-81
```

```
                                        .SBTTL  DECLARATIONS    ; Declarative Part of Module
                                ;
                                ; INCLUDE FILES:          none
                                ;
                                ; EXTERNAL SYMBOLS:
                                        .DSABL  GBL             ; Prevent undefineds from becoming
                                                                ; Global
                                        .EXTRN  MTH$HSIN_R5     ; H Floating sine routine (radians)
                                        .EXTRN  MTH$HCOS_R5     ; H Floating cosine routine (radians)
                                        .EXTRN  MTH$HSINCOS_R7  ; H Floating sine and cosine routine (radians)
                                        .EXTRN  MTH$HSINCOSD_R7 ; H Floating sine and cosine routine (degrees)
                                        .EXTRN  MTH$$SIGNAL     ; Math error signal routine
                                        .EXTRN  MTH$$SIGNAL_CON ; Handler that just returns
                                        .EXTRN  MTH$K_FLOOVEMAT ; Error code
                                        .EXTRN  MTH$K_FLOUNDMAT ; Error code
                                        .EXTRN  MTH$$JACKET_TST ;
                                        .EXTRN  MTH$HSIND_R5    ; H Floating sine routine (degrees)
                                        .EXTRN  MTH$HCOSD_R5    ; H Floating cosine routine (degrees)
                                ;
                                ; EQUATED SYMBOLS:        none
                                ;
                                ; MACROS:
                                        $SFDEF                  ; Define SF (Stack Frame) symbols
                                ;
                                ;
                                ; PSECT DECLARATIONS:
                                ;
                                        .PSECT  _MTH$CODE       PIC,SHR,LONG,EXE,NOWRT
                                                                ; Program section for math routines
                                ;
                                ; OWN STORAGE:  none
                                ;
                                ; CONSTANTS:
                                        HTAN = 4                ; Position of output parameter from AP
                                        HTAND = 4               ; Position of output parameter from AP
                                        X = 8                   ; Position of input parameter from AP
                                ;
                                H_SMALLEST_DEG:
3C1FC1A6 CA5D0006               .LONG   ^XCA5D0006, ^X3C1FC1A6          ; 180/pi*2**-16384
81A5A6FE 152E7B86               .LONG   ^X152E7B86, ^X81A5A6FE
```

```
                                0010   110          .SBTTL  MTH$HTAN  - Standard H Floating HTAN
                                0010   111
                                0010   112
                                0010   113 ;++
                                0010   114 ; FUNCTIONAL DESCRIPTION:
                                0010   115 ;
                                0010   116 ; HTAN  - H floating point tangent function
                                0010   117 ;
                                0010   118 ;       For algorithm, see MTH$HTAN_R7
                                0010   119 ;
                                0010   120 ; CALLING SEQUENCE:
                                0010   121 ;
                                0010   122 ;       CALL MTH$HTAN(HTAN.wh.r, X.rh.r)
                                0010   123 ;
                                0010   124 ;
                                0010   125 ; INPUT PARAMETERS:
                                0010   126 ;
                                0010   127 ;       X.rh.r                          Address of value of angle in radians.
                                0010   128 ;
                                0010   129 ; IMPLICIT INPUTS:      none
                                0010   130 ;
                                0010   131 ; OUTPUT PARAMETERS:
                                0010   132 ;
                                0010   133 ;
                                0010   134 ;       VALUE:  H floating tangent of the argument.
                                0010   135 ;               Output parameter is the first parameter from the left.
                                0010   136 ;
                                0010   137 ; IMPLICIT OUTPUTS:      none
                                0010   138 ;
                                0010   139 ; COMPLETION CODES:      none
                                0010   140 ;
                                0010   141 ; SIDE EFFECTS:
                                0010   142 ;
                                0010   143 ;       NONE
                                0010   144 ;
                                0010   145 ;--
                                0010   146
                                0010   147
                        40FC    0010   148          .ENTRY  MTH$HTAN, ^M<IV, R2, R3, R4, R5, R6, R7>
                                0012   149                                          ; Standard call-by-reference entry
                                0012   150                                          ; Disable DV (and FU), enable IV
                                0012   151          MTH$FLAG_JACKET                 ; Flag that this is a jacket procedure in
                                0012                                                ;
 6D   00000000'GF    9E         0012                MOVAB   G^MTH$$JACKET_HND, (FP)
                                0019                                                ; set handler address to jacket
                                0019                                                ; handler
                                0019                                                ;
                                0019   152                                          ; case of an error in special routine
      50    08 BC 70FD          0019   153          MOVH    @X(AP), R0              ; R0/R3 = argument
                06   10         001E   154          BSBB    MTH$HTAN_R7             ; Call special HTAN routine
      04 BC    50 7DFD          0020   155          MOVQ    R0, @HTAN(AP)           ; Store result in second argument
                   04           0025   156          RET                             ; Return to caller
```

```
                        0026   158          .SBTTL  MTH$HTAN_R7 - JSB entry point
                        0026   159 ;
                        0026   160 ;++
                        0026   161 ; FUNCTIONAL DESCRIPTION:
                        0026   162 ;
                        0026   163 ; HTAN - JSB entry point
                        0026   164 ;
                        0026   165 ; Algorithmic steps:
                        0026   166 ;  1. Compute HSIN and HCOS.
                        0026   167 ;  2. If HCOS is zero, we have an error.
                        0026   168 ;  3. Return HSIN / HCOS.
                        0026   169 ;
                        0026   170 ; CALLING SEQUENCE:
                        0026   171 ;
                        0026   172 ;       MOVH    argument, R0
                        0026   173 ;       JSB     MTH$HTAN_R7
                        0026   174 ;
                        0026   175 ; INPUT PARAMETERS:
                        0026   176 ;
                        0026   177 ;       R0 / R3 contains x
                        0026   178 ;
                        0026   179 ; IMPLICIT INPUTS:
                        0026   180 ;
                        0026   181 ;       NONE
                        0026   182 ;
                        0026   183 ; OUTPUT PARAMETERS:
                        0026   184 ;
                        0026   185 ;       The result is the H-floating tangent of x.
                        0026   186 ;
                        0026   187 ; IMPLICIT OUTPUTS:
                        0026   188 ;
                        0026   189 ;       NONE
                        0026   190 ;
                        0026   191 ; SIDE EFFECTS:
                        0026   192 ;
                        0026   193 ;       NONE
                        0026   194 ;--
                        0026   195 MTH$HTAN_R7::
00000000'GF   16        0026   196          JSB     G^MTH$HSINCOS_R7        ; Compute HSIN, and HCOS of X
        54 73FD         002C   197          TSTH    R4                      ; Is HCOS zero ?
        05   13         002F   198          BEQL    30$                     ; If zero, HTAN is infinite
     50 54 66FD         0031   199          DIVH2   R4, R0                  ; Compute HSIN / HCOS
           05           0035   200          RSB                             ; Return to caller
                        0036   201 ;
                        0036   202 ; HCOS is zero, so HTAN is infinite.  Go to common error code.
                        0036   203 ;
                        0036   204 30$:
        00DF   31       0036   205          BRW     COSZER
```

```
                        0039   207          .SBTTL  MTH$HTAN_R5 - JSB entry point
                        0039   208 ;
                        0039   209 ;++
                        0039   210 ; FUNCTIONAL DESCRIPTION:
                        0039   211 ;
                        0039   212 ; HTAN - JSB entry point
                        0039   213 ;
                        0039   214 ; Algorithmic steps:
                        0039   215 ;  1. Compute HSIN and HCOS.
                        0039   216 ;  2. If HCOS is zero, we have an error.
                        0039   217 ;  3. Return HSIN / HCOS.
                        0039   218 ;
                        0039   219 ; CALLING SEQUENCE:
                        0039   220 ;
                        0039   221 ;       MOVH    argument, R0
                        0039   222 ;       JSB     MTH$HTAN_R5
                        0039   223 ;
                        0039   224 ; INPUT PARAMETERS:
                        0039   225 ;
                        0039   226 ;       R0 / R3 contains x
                        0039   227 ;
                        0039   228 ; IMPLICIT INPUTS:
                        0039   229 ;
                        0039   230 ;       NONE
                        0039   231 ;
                        0039   232 ; OUTPUT PARAMETERS:
                        0039   233 ;
                        0039   234 ;       The result is the H-floating tangent of x.
                        0039   235 ;
                        0039   236 ; IMPLICIT OUTPUTS:
                        0039   237 ;
                        0039   238 ;       NONE
                        0039   239 ;
                        0039   240 ; SIDE EFFECTS:
                        0039   241 ;
                        0039   242 ;       NONE
                        0039   243 ;--
                        0039   244 MTH$HTAN_R5::
    7E    50 70FD       0039   245          MOVH    R0, -(SP)                       ; Save argument
00000000'EF   16        003D   246          JSB     MTH$HCOS_R5                     ; Compute HCOS
    7E    50 70FD       0043   247          MOVH    R0, -(SP)                       ; Save HCOS
          13   13        0047   248          BEQL    20$                             ; If zero, HTAN is infinite
 50   10 AE 7DFD       0049   249          MOVQ    16(SP), R0                      ; Get argument back
00000000'GF   16        004E   250          JSB     G^MTH$HSIN_R5                   ; Compute HSIN
    50    8E 66FD       0054   251          DIVH2   (SP)+, R0                       ; Compute HSIN / HCOS
    5E    10   C0        0058   252          ADDL2   #16, SP                         ; Discard saved argument
               05        005B   253          RSB                                     ; Return to caller
                        005C   254 ;+
                        005C   255 ; Come here if HCOS is zero.  This means that HTAN is infinite.
                        005C   256 ;-
                        005C   257 20$:
    5E    20   C0        005C   258          ADDL2   #32, SP                         ; Discard saved HCOS and saved argument
       00B6   31        005F   259          BRW     COSZER                          ; Go to common error code
                        0062   260
```

```
                        0062   262          .SBTTL  MTH$HTAND  - Standard H Floating HTAND
                        0062   263
                        0062   264
                        0062   265 ;++
                        0062   266 ; FUNCTIONAL DESCRIPTION:
                        0062   267 ;
                        0062   268 ; HTAND  - H floating point tangent function
                        0062   269 ;
                        0062   270 ;           For algorithm, see MTH$HTAND_R7
                        0062   271 ;
                        0062   272 ; CALLING SEQUENCE:
                        0062   273 ;
                        0062   274 ;       CALL MTH$HTAND(HTAND.wh.r, X.rh.r)
                        0062   275 ;
                        0062   276 ;
                        0062   277 ; INPUT PARAMETERS:
                        0062   278 ;
                        0062   279 ;       X.rh.r                          address of value of angle in degrees.
                        0062   280 ;
                        0062   281 ; IMPLICIT INPUTS:      none
                        0062   282 ;
                        0062   283 ; OUTPUT PARAMETERS:
                        0062   284 ;
                        0062   285 ;
                        0062   286 ;       VALUE:  H floating tangent of the argument.
                        0062   287 ;               Output parameter is the first argument from the left.
                        0062   288 ;
                        0062   289 ; IMPLICIT OUTPUTS:      none
                        0062   290 ;
                        0062   291 ; COMPLETION CODES:      none
                        0062   292 ;
                        0062   293 ; SIDE EFFECTS:
                        0062   294 ;
                        0062   295 ;       NONE
                        0062   296 ;---
                        0062   297
                        0062   298
                   40FC 0062   299          .ENTRY  MTH$HTAND, ^M<IV, R2, R3, R4, R5, R6, R7>
                        0064   300                                                  ; Standard call-by-reference entry
                        0064   301                                                  ; Disable DV (and FU), enable IV
                        0064   302          MTH$FLAG_JACKET                         ; Flag that this is a jacket procedure in
                        0064                                                        ;
6D  00000000'GF   9E    0064                MOVAB   G^MTH$$JACKET_HND, (FP)
                        006B                                                        ; set handler address to jacket
                        006B                                                        ; handler
                        006B                                                        ;
                        006B   303                                                  ; case of an error in special routine
      50   08 BC 70FD  006B   304          MOVH    @X(AP), R0                      ; R0/R3 = argument
                 06   10 0070   305          BSBB    MTH$HTAND_R7                    ; Call special HTAND routine
      04 BC    50 7DFD  0072   306          MOVQ    R0, @HTAND(AP)                  ; Store result in second argument
                   04   0077   307          RET                                     ; Return to caller
```

```
                     0078   309          .SBTTL  MTH$HTAND_R7 - JSB entry point
                     0078   310 ;
                     0078   311 ;++
                     0078   312 ; FUNCTIONAL DESCRIPTION:
                     0078   313 ;
                     0078   314 ; HTAND - JSB entry point
                     0078   315 ;
                     0078   316 ; Algorithmic steps:
                     0078   317 ;  1. Make sure that the absolute value of the argument is greater than
                     0078   318 ;     180/pi*2**-16384 to avoid underflow in HSIND.
                     0078   319 ;  2. Compute HSIND and HCOSD.
                     0078   320 ;  3. If HCOSD is zero, we have an error.
                     0078   321 ;  4. Return HSIND / HCOSD.
                     0078   322 ;
                     0078   323 ; CALLING SEQUENCE:
                     0078   324 ;
                     0078   325 ;       MOVH    argument, R0
                     0078   326 ;       JSB     MTH$HTAND_R7
                     0078   327 ;
                     0078   328 ; INPUT PARAMETERS:
                     0078   329 ;
                     0078   330 ;       R0 / R3 contains x
                     0078   331 ;
                     0078   332 ; IMPLICIT INPUTS:
                     0078   333 ;
                     0078   334 ;       NONE
                     0078   335 ;
                     0078   336 ; OUTPUT PARAMETERS:
                     0078   337 ;
                     0078   338 ;       The result is the H-floating tangent of x.
                     0078   339 ;
                     0078   340 ; IMPLICIT OUTPUTS:
                     0078   341 ;
                     0078   342 ;       NONE
                     0078   343 ;
                     0078   344 ; SIDE EFFECTS:
                     0078   345 ;
                     0078   346 ;       NONE
                     0078   347 ;--
                     0078   348 MTH$HTAND_R7::
          7E    50 70FD   0078   349          MOVH    R0, -(SP)                       ; Save argument
  6E      8000  8F  AA    007C   350          BICW    #^X8000, (SP)                   ; (SP) = |argument|
          6E    07  B1    0081   351          CMPW    #7, (SP)                        ; Compare |ARG| with 2**-16377
                14  15    0084   352          BLEQ    20$                             ; No possible underflow compute HTAND.
  6E      FF75  CF  71FD  0086   353          CMPH    H_SMALLEST_DEG, (SP)            ; Possible underflow, use better check
                0C  15    008C   354          BLEQ    20$                             ; No underflow.
                6E  73FD  008E   355          TSTH    (SP)                            ; If |arg| = 0, no underflow, otherwise
                5E  12    0091   356          BNEQ    UNFL                            ; HSIND will underflow
          5E    10  C0    0093   357          ADDL    #16, SP                         ; Remove argument from the stack
                50  7CFD  0096   358          CLRH    R0                              ; Zero the result
                    05    0099   359          RSB                                     ; Return with value = 0
                          009A   360 20$:
          5E    10  C0    009A   361          ADDL2   #16, SP                         ; Discard saved argument
 00000000'GF    16  009D   362          JSB     G^MTH$HSINCOSD_R7                       ; Compute HCOSD
                54  73FD  00A3   363          TSTH    R4                              ; Is HCOSD zero ?
                70  13    00A6   364          BEQL    COSZER                          ; If zero, HTAND is infinite
          50    54  66FD  00A8   365          DIVH2   R4, R0                          ; Compute HSIND / HCOSD
```

```
05  00AC   366          RSB                         ; Return to caller
    00AD   367
```

```
                                00AD   369          .SBTTL  MTH$HTAND_R5 - JSB entry point
                                00AD   370 ;
                                00AD   371 ;++
                                00AD   372 ; FUNCTIONAL DESCRIPTION:
                                00AD   373 ;
                                00AD   374 ; HTAND - JSB entry point
                                00AD   375 ;
                                00AD   376 ; Algorithmic steps:
                                00AD   377 ;  1. Make sure that the absolute value of the argument is greater than
                                00AD   378 ;     180/pi*2**-16384 to avoid underflow in HSIND.
                                00AD   379 ;  2. Compute HSIND and HCOSD.
                                00AD   380 ;  3. If HCOSD is zero, we have an error.
                                00AD   381 ;  4. Return HSIND / HCOSD.
                                00AD   382 ;
                                00AD   383 ; CALLING SEQUENCE:
                                00AD   384 ;
                                00AD   385 ;       MOVH    argument, R0
                                00AD   386 ;       JSB     MTH$HTAND_R5
                                00AD   387 ;
                                00AD   388 ; INPUT PARAMETERS:
                                00AD   389 ;
                                00AD   390 ;       R0 / R3 contains x
                                00AD   391 ;
                                00AD   392 ; IMPLICIT INPUTS:
                                00AD   393 ;
                                00AD   394 ;       NONE
                                00AD   395 ;
                                00AD   396 ; OUTPUT PARAMETERS:
                                00AD   397 ;
                                00AD   398 ;       The result is the H-floating tangent of x.
                                00AD   399 ;
                                00AD   400 ; IMPLICIT OUTPUTS:
                                00AD   401 ;
                                00AD   402 ;       NONE
                                00AD   403 ;
                                00AD   404 ; SIDE EFFECTS:
                                00AD   405 ;
                                00AD   406 ;       NONE
                                00AD   407 ;--
                                00AD   408 MTH$HTAND_R5::
      7E    50 70FD             00AD   409          MOVH    R0, -(SP)                ; Save argument
50    8000  8F    AA            00B1   410          BICW    #^X8000, R0              ; R0/R3 = |argument|
      50    07    B1            00B6   411          CMPW    #7, R0                   ; Compare |ARG| with 2**-16377
            11    15            00B9   412          BLEQ    20$                      ; No possible underflow compute HTAND.
50    FF40  CF 71FD             00BB   413          CMPH    H_SMALLEST_DEG, R0       ; Possible underflow, use better check
            09    15            00C1   414          BLEQ    20$                      ; No underflow.
            50 73FD             00C3   415          TSTH    R0                       ; If |arg| = 0, no underflow, otherwise
            29    12            00C6   416          BNEQ    UNFL                     ; HSIND will underflow
      5E    10    C0            00C8   417          ADDL    #16, SP                  ; Remove argument from the stack
                  05            00CB   418          RSB                              ; Return with value = 0
                                00CC   419 20$:
 00000000'EF    16               00CC   420          JSB     MTH$HCOSD_R5             ; Compute HCOSD
      7E    50 70FD             00D2   421          MOVH    R0, -(SP)                ; Save HCOSD
            13    13            00D6   422          BEQL    30$                      ; If zero, HTAND is infinite
  50    10  AE 7DFD             00D8   423          MOVO    16(SP), R0               ; Get argument back
 00000000'GF    16               00DD   424          JSB     G^MTH$HSIND_R5           ; Compute HSIND
      50    8E 66FD             00E3   425          DIVH2   (SP)+, R0                ; Compute HSIND / HCOSD
```

```
                     00E7   426          ADDL2   #16, SP                ; Discard saved argument
                     00EA   427          RSB                             ; Return to caller
                     00EB   428 ;+
                     00EB   429 ; Come here if HCOSD is zero.  This means that HTAND is infinite.
                     00EB   430 ;-
                     00EB   431 30$:     ADDL2   #32, SP                 ; Discard saved HCOSD and saved argument
                     00EE   432          BRW     COSZER                  ; Go to common error code
                     00F1   433
```

```
                                00F1   435 ;
                                00F1   436 ;       COMMON ERROR CODE
                                00F1   437 ;
                                00F1   438
                                00F1   439 ;
                                00F1   440 ; Underflow; if user has FU set, signal error.  Always return 0.0
                                00F1   441 ;
                                00F1   442 UNFL:
            5E    10    C0    00F1   443         ADDL    #16, SP                     ; Remove argument from stack
                  52    DC    00F4   444         MOVPSL  R2                          ; R2 = user's or jacket routine's PSL
00000000'GF       00    FB    00F6   445         CALLS   #0, G^MTH$$JACKET_TST       ; R0 = TRUE if JSB from jacket routine
                04    50    E9    00FD   446         BLBC    R0, 10$                     ; branch if user did JSB
          52    04    AD    3C    0100   447         MOVZWL  SF$W_SAVE_PSW(FP), R2       ; get user PSL saved by CALL
                  50    D4    0104   448 10$:      CLRL    R0                          ; R0 = result. LIB$SIGNAL will save in
                                0106   449                                             ; CHF$L_MCH_R0/R1 so any handler can fixup
          0D    52    06    E1    0106   450         BBC     #6, R2, 20$                 ; has user enabled floating underflow?
                  6E    DD    010A   451         PUSHL   (SP)                        ; yes, return PC from special routine
          7E      00'8F     9A    010C   452         MOVZBL  #MTH$K_FLOUNDMAT, -(SP)     ; trap code for hardware floating underflow
                                0110   453                                             ; convert to MTH$_FLOUNDMAT (32-bit VAX-11
                                0110   454                                             ; exception code)
00000000'GF       02    FB    0110   455         CALLS   #2, G^MTH$$SIGNAL           ; signal (condition, PC)
                  05    0117   456 20$:      RSB                                 ; return
                                0118   457 ;+
                                0118   458 ; Come here if the tangent is infinite because COS is zero.
                                0118   459 ; Give an error signal.
                                0118   460 ;-
                                0118   461 COSZER:
                  6E    DD    0118   462         PUSHL   (SP)                        ; Push user "call" PC
        7E      00'8F     9A    011A   463         MOVZBL  #MTH$K_FLOOVEMAT, -(SP)     ; Condition value
    50    01    0F    79    011E   464         ASHQ    #15, #T, R0                 ; R0/R3 = reserved operand
                  52    7C    0122   465         CLRQ    R2                          ; ...
00000000'GF       02    FB    0124   466         CALLS   #2, G^MTH$$SIGNAL           ; Signal an error
                  05    012B   467         RSB                                 ; Return to caller
                                012C   468
                                012C   469         .END
```

```
COSZER              00000118 R      02
HTAN              = 00000004
HTAND             = 00000004
H_SMALLEST_DEG      00000000 R      02
MTH$$JACKET_HND     ********   X    02
MTH$$JACKET_TST     ********   X    00
MTH$$SIGNAL         ********   X    00
MTH$$SIGNAL_CON     ********   X    00
MTH$HCOSD_R5        ********   X    00
MTH$HCOS_R5         ********   X    00
MTH$HSINCOSD_R7     ********   X    00
MTH$HSINCOS_R7      ********   X    00
MTH$HSIND_R5        ********   X    00
MTH$HSIN_R5         ********   X    00
MTH$HTAN            00000010 RG     02
MTH$HTAND           00000062 RG     02
MTH$HTAND_R5        000000AD RG     02
MTH$HTAND_R7        00000078 RG     02
MTH$HTAN_R5         00000039 RG     02
MTH$HTAN_R7         00000026 RG     02
MTH$K_FLOOVEMAT     ********    X   00
MTH$K_FLOUNDMAT     ********    X   00
SF$W_SAVE_PSW     = 00000004
UNFL                000000F1 R      02
X                 = 00000008
```

Psect synopsis

PSECT name	Allocation	PSECT No.	Attributes
. ABS .	00000000 (0.)	00 (0.)	NOPIC USR CON ABS LCL NOSHR NOEXE NORD NOWRT NOVEC BYTE
ABS	00000000 (0.)	01 (1.)	NOPIC USR CON ABS LCL NOSHR EXE RD WRT NOVEC BYTE
_MTH$CODE	0000012C (300.)	02 (2.)	PIC USR CON REL LCL SHR EXE RD NOWRT NOVEC LONG

Performance indicators

Phase	Page faults	CPU Time	Elapsed Time
Initialization	30	00:00:00.08	00:00:00.70
Command processing	106	00:00:00.58	00:00:03.69
Pass 1	125	00:00:01.69	00:00:06.16
Symbol table sort	0	00:00:00.03	00:00:00.04
Pass 2	106	00:00:01.09	00:00:04.82
Symbol table output	5	00:00:00.04	00:00:00.04
Psect synopsis output	5	00:00:00.02	00:00:00.02
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	379	00:00:03.55	00:00:15.47

```
The working set limit was 1050 pages.
8438 bytes (17 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 53 non-local and 7 local symbols.
529 source lines were read in Pass 1, producing 16 object records in Pass 2.
9 pages of virtual memory were used to define 8 macros.
```

```
                                +----------------------------+
                                ! Macro library statistics !
                                +----------------------------+

Macro library name                          Macros defined
------------------                          --------------
_$255$DUA28:[SYSLIB]STARLET.MLB;2                    4

88 GETS were required to define 4 macros.

There were no errors, warnings or information messages.

MACRO/ENABLE=SUPPRESSION/DISABLE=(GLOBAL,TRACEBACK)/LIS=LIS$:MTHHTAN/OBJ=OBJ$:MTHHTAN MSRC$:MTHJACKET/UPDATE=(ENH$:MTHJACKET)+MSRC$:
```

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MTHIMAX0
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MTHHNINT
LIS

MTHHSINH
LIS

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LIS

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LIS

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LIS

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